Claims

1. An insulation material which comprises an inorganic, porous matrix and is obtainable by shaping a composition comprising a) a sol comprising nanoparticles and/or polycondensates or precursors thereof as binder and b) solid pore formers or applying this composition to a substrate and curing the composition to form the porous matrix and additional pores formed by means of the pore former.

2. The insulation material as claimed in claim 1, characterized in that the mean pore diameter of the additional pores is greater than that of the porous matrix.

3. The insulation material as claimed in claim 1 or 2, characterized in that the porous matrix is a microporous or mesoporous matrix.

4. The insulation material as claimed in any of claims 1 to 3, characterized in that organic compounds or organic groups which can be burned out to produce the inorganic matrix are present in the composition.

5. The insulation material as claimed in any of claims 1 to 4, characterized in that the additional pores are macropores.

6. The insulation material as claimed in any of claims 1 to 5, characterized in that the nanoparticles comprise at least one metal oxide, preferably SiO_2, Al_2O_3, AlOOH, Ta_2O_5, TiO_2 and/or ZrO_2, with particular preference being given to at least part of or all nanoparticles being composed of SiO_2.

7. The insulation material as claimed in any of claims 4 to 6, characterized in that the composition comprises a nanocomposite composed of nanoparticles which have been surface-modified by means of organic compounds or compounds containing organic groups as binder and the organic components of the nanocomposite are burned out to form the matrix.

8. The insulation material as claimed in claim 7, characterized in that the nanocomposite is obtained by modifying the surface of the nanoparticles by means of one or more compounds selected from among hydrolyzable silanes having at least one nonhydrolyzable, organic group, carboxylic acids, anhydrides, amides, amine compounds, imines, β-diketones, amino acids and proteins.

9. The insulation material as claimed in any of claims 1 to 7, characterized in that the nanocomposite is obtained by modifying the surface of the nanoparticles by means of one or more silanes of the general formula

$$R_nSiX_{4-n} \qquad (I)$$

where the groups X are identical or different and are hydrolyzable groups or hydroxyl groups, the radicals R are identical or different and are each alkyl, alkenyl, alkynyl, aryl, aralkyl or alkylaryl and n is 0, 1, 2 or 3, with n preferably being greater than 0 for at least one silane.

10. The insulation material as claimed in claim 9, characterized in that the nanocomposite is obtained by modifying the surface of the nanoparticles by means of at least one silane of the formula

$$R_nSiX_{4-n} \qquad (I)$$

where n = 1 or 2, and at least one silane of the formula

$$SiX_4 \qquad (II)$$

where X is as defined in formula (I).

11. The insulation material as claimed in any of claims 1 to 10, characterized in that the composition comprises hydrolysis products or condensation products of one or more hydrolyzable compounds of glass- or ceramic-forming metals as polycondensates or precursors thereof.

12. The insulation material as claimed in claim 11, characterized in that at least one hydrolyzable compound has at least one nonhydrolyzable substituent.

13. The insulation material as claimed in claim 11 or 12, characterized in that at least one hydrolyzable compound is selected from among Si, Al, B, Sn, Ti, Zr, Mg, V and Zn compounds.

14. The insulation material as claimed in any of claims 1 to 13, characterized in that the binder sol comprises polycondensates or a precursor thereof and surface-modified nanoparticles.

15. The insulation material as claimed in any of claims 1 to 14, characterized in that the composition comprises at least one refractory component.

16. The insulation material as claimed in any of claims 1 to 15, characterized in that particles which are hollow and/or comprise a thermally decomposable or vaporizable material or are an intumescent agent are used as pore formers.

17. The insulation material as claimed in claim 16, characterized in that the composition comprises hollow bodies as pore formers.

18. The insulation material as claimed in claim 17, characterized in that the hollow body is composed of glass or plastic.

19. The insulation material as claimed in any of claims 1 to 17, characterized in that the composition comprises thermally decomposable or vaporizable particles which are thermally decomposed or vaporized to form the additional pores.

20. The insulation material as claimed in claim 19, characterized in that thermally decomposable or vaporizable particles composed of a metal nitrate, an organic salt, NH_4Cl, carbon black, flour, wood flour, wax, protein, polysaccharide, silicone resin or plastic are used.

21. The insulation material as claimed in claim 19 or 20, characterized in that the thermally decomposable or vaporizable particles are hollow.

22. The insulation material as claimed in any of claims 1 to 21, characterized in that the shaped or applied composition is heat-treated at a temperature of at least 40°C to cure the composition.

23. The insulation material as claimed in any of claims 1 to 22, characterized in that the shaped or applied composition is heat-treated in at least two stages having different temperatures.

24. The insulation material as claimed in claim 22 or 23, characterized in that the composition is heat-

treated at a temperature of at least 100°C, preferably at least 150°C, to effect intermediate curing or curing.

25. The insulation material as claimed in any of claims 22 to 24, characterized in that the composition is cured at a temperature of at least 300°C, preferably at least 350°C.

26. The insulation material as claimed in any of claims 4 to 25, characterized in that the composition comprises at least one organic monomer, oligomer or polymer as additive to control the viscosity and/or the binding strength of the molding.

27. The insulation material as claimed in any of claims 1 to 26, characterized in that it is in the form of a molding or a coating on a substrate.

28. A process for producing an insulation material comprising an inorganic, porous matrix, which comprises shaping a composition comprising a) a sol comprising nanoparticles and/or polycondensates or precursors thereof as binder and b) solid pore formers or applying this composition to a substrate and curing the composition to form the porous matrix and additional pores formed by means of the pore former.

29. The use of an insulation material as claimed in any of claims 1 to 27 for insulation against heat and cold, for a combination of insulation and fire protection or for thermal encapsulation of heat-sensitive components.